AMENDMENTS TO THE CLAIMS

The claims and their status are reflected below.

1. (Original) A sensing apparatus for sensing conditions in target environments in a processing facility where a standard substrate is transported in a standard substrate carrier that establishes a position of the standard substrate relative to a surface of the standard substrate carrier and where the robot of at least one processing tool is calibrated to the position of the standard substrate relative to the surface of the standard substrate carrier, comprising:

a first portion that includes:

a substrate;

a plurality of sensors attached to the substrate;

a second portion that includes:

a substrate carrier that establishes the position of the first portion relative to a surface of the substrate carrier to be the same as the position of the standard substrate relative to the surface of the standard substrate carrier;

an electronics module that communicates with the first portion, the electronics module attached to the substrate carrier; and

wherein the first portion may be moved independently of the second portion.

2. (Original) The sensing apparatus of claim 1 wherein the substrate carrier is a standard substrate carrier.

3. (Previously presented) The sensing apparatus of claim 1 wherein the position of the standard substrate relative to the surface of the standard substrate carrier is the vertical height of the standard substrate above the bottom surface of the standard substrate carrier.

4. (Original) The sensing apparatus of claim 1 further comprising:

a receiving unit attached to the substrate that receives power from the electronics module; and

a transmitting unit in the electronic module that transmits power to the receiving unit.

5. (Original) The sensing apparatus of claim 4 wherein the receiving unit is located at the center of the substrate so that when the substrate is placed in the substrate carrier the receiving unit is aligned with the transmitting unit regardless of the rotational orientation of the substrate.

6. (Original) The sensing apparatus of claim 4 wherein the receiving unit receives data from the electronics module and the transmitting unit transmits data to the receiving unit.

7. (Original) The sensing apparatus of claim 4 wherein the transmitting unit comprises an E-coil and the receiving unit comprises a conductive coil and a magnetic conductive layer.

8. (Original) The sensing apparatus of claim 1 wherein the second portion further comprises an RFID transceiver electrically connected to the electronics module so that data may be sent from the electronics module to the RFID transceiver and data may be sent from the RFID transceiver to an external receiver.

9. (Currently amended) The sensing apparatus of claim 1 further comprising:

a pattern on at least one surface of the substrate; and

an optical reading apparatus attached to the substrate carrier that reads the ~~greycode~~ pattern on the substrate to determine the orientation of the substrate.

10. (Original) The sensing apparatus of claim 1 wherein the second portion further comprises an alignment module that aligns the first portion relative to the substrate carrier.

11. (Original) A sensing apparatus for sensing process conditions in a processing tool that has a robot that transfers a standard substrate between a standard substrate carrier and a process chamber, comprising:

a process condition measuring device, comprising:

a substrate;

a plurality of sensors attached to the substrate;

a handling system, comprising:

a substrate carrier that holds the process condition measuring device, the robot transferring the process condition measuring device between the substrate carrier and the process chamber; and

an electronics module attached to the substrate carrier that communicates with the process condition measuring device while the substrate carrier holds the process condition measuring device.

12. (Original) The sensing apparatus of claim 11 wherein the substrate carrier is a standard substrate carrier.

13. (Original) The sensing apparatus of claim 1 wherein the substrate carrier is a front opening unified pod (FOUP).

14. (Original) The sensing apparatus of claim 11 wherein the substrate carrier is a wafer cassette.

15. (Original) The sensing apparatus of claim 11 wherein the process condition measuring device further includes at least one battery and other components attached to the substrate and the location of the at least one battery and the other components that are attached to the substrate are configured such that the center of gravity of the substrate with the at least one battery and the other components is the same as the center of gravity of the substrate alone.

16. (Original) The sensing apparatus of claim 11 wherein the process condition measuring device further includes conductive traces connecting sensors to a CPU, at least one battery, a clock crystal and an RF inductive coil.

17. (Withdrawn) A process condition measuring device for measuring conditions in a target environment, comprising:

a substrate;

a plurality of sensors attached to the substrate; and

a plurality of components located on the surface of the substrate or within cavities formed in the surface of the substrate such that the balance of the substrate with the plurality of sensors and the plurality of components is the same as the balance of the substrate alone when the substrate spins about a central axis.

18. (Withdrawn) The process condition measuring device of claim 17 wherein the center of gravity of the process condition measuring device is along a central axis of the process condition measuring device, the central axis passing perpendicularly through the center of the surface of the substrate.

19 (Withdrawn) The process condition measuring device of claim 17 wherein the target environment is a process chamber that processes substrates having predetermined physical dimensions and the physical dimensions of the process condition measuring device are the same as the predetermined physical dimensions.

20. (Withdrawn) The process condition measuring device of claim 17 wherein the plurality of components includes two or more batteries that are located equidistant from the central axis and at opposite sides of the central axis.

21. (Withdrawn) The process condition measuring device of claim 17 further comprising an energy receiving device comprising an RF induction coil overlying an RF return pad located at the center of the substrate.

22. (Withdrawn) The process condition measuring device of claim 17 further comprising a plurality of data transmitting devices that transmit data from the process condition measuring device.

23. (Withdrawn) The process condition measuring device of claim 22 wherein the data transmitting devices are LEDS at different locations and wherein individual ones of the plurality of LEDs may be separately enabled or disabled.

24. (Withdrawn) The process condition measuring device of claim 17 further comprising a CPU that is mounted to the substrate and is individually covered by a prefabricated lid.

25. (Withdrawn) The process condition measuring device of claim 24 further comprising a memory IC and a clock crystal and wherein the CPU, the memory IC and the clock crystal are individually covered by prefabricated lids.

26. (Withdrawn) The process condition measuring device of claim 17 further comprising a single prefabricated lid that covers most or all of a surface of the substrate and covers a plurality of components mounted on the surface or mounted within individual cavities within the surface.

27. (Withdrawn) The process condition measuring device of claim 26 wherein the lid is composed of the same material as the substrate.

28. (Withdrawn) The process condition measuring device of claim 17 further comprising a crystal oscillator circuit, the circuit having a temperature compensation feature that modifies a bias voltage within the crystal oscillator circuit to compensate for temperature changes.

29. (Withdrawn) A method of surveying conditions in a target environment comprising:

robotically moving a process condition measuring device from a substrate carrier to a target environment;

acquiring data in the target environment and recording the data in the process condition measuring device;

robotically returning the process condition measuring device to the substrate carrier;

transferring the data from the process condition measuring device to an electronics module attached to the substrate carrier while the process condition measuring device is in the substrate carrier.

30. (Withdrawn) The method of claim 29 further comprising transferring energy from the electronics module to the process condition measuring device and storing the energy within the process condition measuring device.

31. (Withdrawn) The method of claim 29 further comprising sending the data from the electronics module attached to the substrate carrier to a receiver that is not attached to the substrate carrier.

32. (Withdrawn) The method of claim 29 wherein the substrate carrier is a cassette.

33. (Withdrawn) The method of claim 29 wherein the substrate carrier is a front opening unified pod (FOUP).

34. (Withdrawn) The method of claim 29 wherein transferring the data from the process condition measuring device to an electronics module is by light from an LED, the LED being selected from a plurality of LEDs in the process condition measuring device according to a routine that selects the optimum LED.

35. (Withdrawn) The method of claim 29 wherein the process condition measuring device comprises a plurality of electrical components having specified operating temperature ranges and the process conditioning measuring device experiences a high

temperature in the target environment that is outside the specified operating temperature range of at least one of the plurality of electrical components, the process condition measuring device having temperature compensation circuitry to allow the process condition measuring device to operate at the high temperature.

36. (Withdrawn) The method of claim 29 wherein the process condition measuring device is spun at high speed in the target environment.

37. (Withdrawn) The method of claim 29 further comprising determining the position of the process condition measuring device in the substrate carrier.

38. (Withdrawn) The method of claim 29 further comprising moving the process condition measuring device in the substrate carrier.

39. (Withdrawn) The method of claim 29 further comprising changing the rotational orientation of the process condition measuring device in the substrate carrier.

40. (Withdrawn) The method of claim 29 further comprising moving a portion of the electronics module while the process condition measuring device is in the substrate carrier.

41. (Withdrawn) A method of making a process condition measuring device that may collect data and may record or transmit the data for subsequent use, comprising:

depositing a conductive layer on a substrate;

patterning the conductive layer to form a plurality of traces;

forming a plurality of cavities in the substrate;

placing a plurality of electrical components in the plurality of cavities, the plurality of components including at least one sensor and at least one battery;

connecting individual ones of the plurality of electrical components to one or more of the plurality of traces; and

depositing a passivation layer over the traces and components.

42. (Withdrawn) The method of claim 41 further comprising forming a shield layer over the passivation layer.

43. (Withdrawn) The method of claim 42 wherein the shield layer is comprised of a composite of different layers.

44. (Withdrawn) The method of claim 41 further comprising forming a second conductive layer and patterning the second conductive layer to form a second plurality of traces.

45. (Previously presented) A two part apparatus for measuring process conditions within a process chamber, comprising:

a first part that includes a plurality of sensors for measuring one or more process conditions and an energy storage unit attached to a substrate;

a second part that includes a housing for the first part, a power supply unit attached to the housing and a communication unit attached to the housing, the power supply unit providing power to the first part and the communication unit providing communication between the first part and the second part; and

wherein the first part is housed in the second part in a first mode and is moved from the second part to the process chamber, without physical connection to the second part, in a second mode.

46. (Previously presented) The two part apparatus of claim 45 wherein the substrate is a disk with the diameter of a silicon wafer and the housing is a wafer holder.

47. (Previously presented) The two part apparatus of claim 46 wherein the power supply unit has an induction coil that inductively transmits power to the first part.

48. (Previously presented) The two part apparatus of claim 47 wherein the communication unit uses the induction coil to provide communication between the first part and the second part.

49. (Previously presented) The two part apparatus of claim 46 wherein the communication unit uses light to communicate with the first part.

50. (Previously presented) The two part apparatus of claim 45 wherein the housing is a Standard Mechanical Interface (SMIF) box or a Front Opening Unified Pod (FOUP).

51. (Previously presented) An apparatus for measuring conditions in a target environment, comprising:

a process condition measuring device that includes sensors to measure one or more process conditions in the target environment, the process condition measuring device further including a power supply and a first induction coil;

a handling system including a second induction coil, the handling system having a location to hold the process condition measuring device near the second induction coil, the first and second induction coils being inductively coupled when the process condition measuring device is at the location, the inductive coupling transferring both electrical power and data; and

the process condition measuring device being independently movable from the handling system to measure process conditions.

52. (Previously presented) The apparatus of claim 51 wherein power is transferred from the handling system to the process condition measuring device through the inductive coupling and data is transferred from the process condition measuring device to the handling system through the inductive coupling.

53. (Previously presented) The apparatus of claim 52 wherein data is also transferred from the handling system to the process condition measuring device through the inductive coupling.